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A SYSTEMATIC REVISION OF THE GENUS CEREUS MILL.

BY ALWIN BERGER.

Most species of *Cereus*, etc., have been named and described by their authors from small specimens in cultivation. Neither flower nor fruit of many of them has until now been known. Whilst this state of things lasted, a real botanical treatment of the genus proved to be an impossibility. Every author who had to deal with the genus felt obliged, for the sake of bringing some order into the arrangement, to make it entirely dependent upon external characters of the habitus of the plants. Schumann, the most recent monographer of Cactaceae, did likewise, grouping the species according to the size, form and color of their stems into thirty "Reihen," to which he added in his "Nachträge" two more.

Engelmann was the first who made the flower and fruit the chief character to depend upon, when he founded his genus *Echinocereus*.* This he afterwards reunited† with *Cereus* together with *Lepidocereus*, *Eucereus* and *Pilocereus*, as subgenera. *Pilocereus* was established as a genus by Lemaire, and *Cephalocereus* by Pfeiffer. In their original form these two genera were identical. In 1860 Lemaire published *Aporocactus*, and in 1861 *Cleistocactus*. Philippi, the famous explorer of the Chilian flora, founded at the same time his genus *Eulychnia*. In 1897 Console's *Myrtillocactus*, founded upon *Cereus geometrizans*, was published. But these genera found little favor with other botanists.

Since then many *Cerei* cultivated in European gardens have flowered, and their descriptions were collected by Schumann and incorporated in his Monographia or successively published in the Monatsschrift für Kakteenkunde by various cultivators of cacti.

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* Engelmann in Wisliz. Tour North. Mexico. 91. (1848).

† Engelmann in Cacteae of Pl. Fendlerianae (1849), Mem. Amer. Acad. **4**: 50; Coll. Works. 114.

A thorough study of the plants in question and their various peculiarities has shown me that there exist *a number of well defined and most natural subgenera.*

The subgenera here proposed are such as can be established with our present knowledge. Some may be imperfect, like all first attempts. With the extending exploration of Central and South America, and with our ever-increasing knowledge, corrections will of course be made.

My attention was first drawn to this by observing several *Cerei* at La Mortola in Sir Thomas Hanbury's famous gardens, and afterwards while arranging their flowers in my herbarium. To my first obvious observations facts were constantly being added until the whole scheme was worked out. There exists a far greater variety in the characters of flowers and fruits than I at first supposed.

It is a well-known fact that many connecting forms exist in Cactaceae, even between the greater genera. On account of this Dr. Kuntze* reunites most of them under one single genus, *Cactus.* There can be no doubt that connecting forms will also be found between the subgenera, but this cannot affect the fact of their existence. Of course these subgenera may be considered distinct genera by those who accept the new genera of Crassulaceae recently published by Britton and Rose.† Most of these subgenera have distinct geographical areas.

I am fully convinced that Engelmann was perfectly right to include *Pilocereus* as a subgenus under *Cereus.* As it now stands, it is an artificial genus, which required a critical revision. Everybody will perceive this who reads carefully the descriptions of the flowers of the plants at present united under *Pilocereus* by Schumann and Weber. These flowers differ from each other in important details. There remains nothing to maintain the genus in its old form, except the hairy areoles of the stems, a character which is not even the same in all. The greater number of these plants are rare in gardens, and many have never flowered, so that our knowledge of them is very insufficient and does not permit any further critical study.

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* Kuntze & Post, Lexicon Generum Phanerogamarum. (1904).

† N. L. Britton and J. N. Rose, New or noteworthy North American Crassulaceae. Bull. New York Bot. Gard. **3**: 1–45. (1903).

Equally with *Pilocereus*, *Cephalocereus* of Pfeiffer and Schumann has also to be reunited with *Cereus*, as it is well connected by two other subgenera with the rest of the genus.

Before speaking of each subgenus, I give an analytical synopsis, which will help the reader to understand the matter at once.

SYNOPSIS OF THE SUBGENERA OF CEREUS.

I. Flowers rising from a distinct cephalium.
I. CEPHALOCEREUS Pfeiff.

II. Flowers not from a cephalium, several from one and the same areole.
  A. Areoles of the flowering part differing from the rest, more closely set, with numerous long setulose bristles; flowers reddish or yellowish, stamens included; fruit scaly.
  II. LOPHOCEREUS A. Berg.
  B. Areoles of the flowering part not different, with spines, but without setulose bristles; flowers white, stamens exserted; fruit smooth. III. MYRTILLOCACTUS Console.

III. Flowers single from the areoles.
  A. Flowers actinomorphous.
    1. Flowers short, more or less campanulate or tubular. (See also Nos. XV and XVI, with short flowers!)
      a. Flowers tubular.
        * Ovary and tube with wool and hairs or bristles.
          † Ovary densely woolly; petals short, spatulate; fruit very woolly and prickly.
          IV. PACHYCEREUS A. Berg.

†† Flowers hairy; style exserted; fruit hairy; plants covered with long hairs.
V. **OREOCEREUS** A. Berg.

** Ovary and tube naked or the ovary with some very short wool or a few stiff hairs.

† Flowers larger, greenish white; plants very tall.
VI. **LEPIDOCEREUS** Engelm.

†† Flowers small, reddish or brown; plants not gigantic. VII. **STENOCEREUS** A. Berg.

b. Flowers campanulate.

* Ovary and tube scaly, often hairy and setuliferous, style short, deeply divided into numerous stigmata; fruit woolly, setuliferous or prickly.
VIII. **EULYCHNIA** Phil.

** Ovary and tube with very few scales, naked; style often much exserted, with short stigmata; fruit smooth. IX. **PILOCEREUS** A. Berg.

2. Flowers larger, more or less funnel-shaped; stamens generally very numerous, inserted along the tube in two groups, the uppermost adnate at the base of the petals, radiating, the lower ones free and declining.

a. Flowers with a very few minute scales, soon falling off neatly above the ovary; fruit naked, crowned by the remaining recurved style.
X. **PIPTANTHOCEREUS** A. Berg.

b. Flowers with larger scales or hairs and bristles, perianth after flowering drying and finally deciduous or remaining; fruit never naked.

* Scales of ovary and tube foliaceous, increasing in size with the growing fruit, in their axils neither wool, hairs nor spines; stems triangular, sarmentose, rooting. XI. **HYLOCEREUS** A. Berg.

** Scales of ovary and tube not foliaceous, always with wool, hairs or bristles.

† Tube of perianth with hairs or wool, but not armed with bristles.

‡ Ovary and tube without bristles, but more or less densely covered with long curled hairs; fruit not colored, unarmed, hairy.
XII. **TRICHOCEREUS** A. Berg.

‡‡ Ovary often with a few spines and with copious white wool, also the tube woolly in the axils of the scales; fruit red, often prickly, pulvilli more or less raised.
XIII. **ERIOCEREUS** A. Berg.

†† Tube and ovary with hairs or wool, but always with a greater or less number of often setulose bristles; fruit aculeate.
‡ Flowers large, with a long and slender tube.
XIV. Eucereus Engelm.
‡‡ Flowers short.
Stems slender, much elongated.
XV. Leptocereus A. Berg.
Stems short, stigmata invariably green.
XVI. Echinocereus Engelm.

B. Flowers zygomorphous.
1. Perianth narrowly tubular, curved in form of an ∫, with small and numerous appressed scales; ovary and tube woolly; petals small. XVII. Cleistocactus Lem.
2. Perianth tubular, slightly bent upwards above the ovary in form of an √, with patent sepaloid and petaloid, rather broad perianth leaves; ovary with stiff hairs.
XVIII. Aporocactus Lem.

I. CEPHALOCEREUS Pfeiffer in Otto & Dietr. Allgemeine Gartenztg. 6: 142. (1838). — K. Sch. in Engler & Prantl, Nat. Pflanzenfam. III. 6a: 181.

This subgenus is characterized by the formation of a cephalium, — that is to say, the floriferous region of the plant is differentiated from the rest. The ribs are divided into little isolated mamillae surrounded by long hairs and spines. The flowers, which are small, rise singly from the top of the mamillae.

The reader will be best informed about this subgenus if he looks at plate 3, and pages 92–93 of K. Goebel's excellent Pflanzenbiologische Schilderungen, I Theil. (Marburg, 1889.)

Our knowledge of these plants is lamentably poor, and material for further investigation is greatly needed.

The following five species, all tall arborescent plants from Mexico and Brazil, are enumerated by Schumann: —

Cereus (*Cephalocereus*) *chrysomallus* Hemsley.— K. Schumann, Monographia. 200.* — Mexico.

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* As I do not wish to give full references to literature, I have thought it advisable to mention only K. Schumann's Monographia Cactacearum, 1899, where all references can easily be found.

C. (*Cephalocereus*) *columna-Trajani* Karw. l. c. 198. — Mexico.
C (*Cephalocereus*) *macrocephalus* (Web.) A. Berg. l. c. 197. — Mexico.
C. (*Cephalocereus*) *melocactus* (Vell.) A. Berg. l. c. 199. — Brazil.
C. (*Cephalocereus*) *senilis* DC. l. c. 201. — Mexico.

II. LOPHOCEREUS A. Berg.

Areoles of the flowering part of the branches differing from the rest, more closely set, with short white wool and long stiff setulose bristles. Flowers small (4 cm.), several from one and the same areole; ovary roundish with a few naked scales; tube funnel-shaped, with several deltoid-lanceolate scales; perianth leaves not very numerous, exterior lanceolate, acute, interior ones oblong, obtuse, spreading, reddish or yellowish; filaments inserted below the middle of the tube, not very numerous, not exceeding the petals; style longer than the stamens, with 5–6 short stigmata. Berry ca. 1 cm. in diameter, red, with a few broadly deltoid scales; seeds comparatively large, slightly keeled, with shining black smooth testa. —*Plate 8, f. 4–8.*

Cereus Schottii Engelm. is the type of this subgenus. When the plant is old and about to flower, the areoles grow closer together and produce a profusion of long setulose bristles, which give the plant a very curious aspect. This species has been considered to be a *Pilocereus*, but the bristles are much unlike the hairs of this genus; besides, the flowers are very different, and in *Pilocereus* they are always single.

Schumann [*] was inclined to unite this plant with *Myrtillocactus*, but I think it better to create a proper subgenus, on account of the great difference in the general appearance of the plant, the larger reddish flowers with enclosed stamens, and the scaly fruit.

According to Mr. Brandegee, however, there occurs a variety of *C. Schottii* Engelm. near Todos Santos, in Baja California, which has not such setulose bristles, but only the small spines of the juvenile state. When better known, this plant will perhaps form a transition from this subgenus to *Myrtillocactus*.

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[*] Nachtr. 64.

Very likely also *Pilocereus scoparius* Pos., which is said to be closely related to *C. Schottii*, belongs here.

I have a very fine dried specimen of *C. Schottii*, which I received from Mr. F. De Laet, of Contich. It has 8 ribs, the areoles very closely set, and grayish tortuose bristles, which are flexible, not very pungent and spirally twisted just as the seta of many mosses are.

Cereus (*Lophocereus*) *Schottii* Engelm. l. c. 171. — North Mexico, Baja California, Arizona.

C. (*Lophocereus* ?) *scoparius* (Poselg.) A. Berg. l. c. 179. — Mexico.

C. (*Lophocereus* ?) *Urbanianus* (K. Sch.) A. Berg. l. c. 193. — Guadeloupe Island.

III. MYRTILLOCACTUS Console in Bollet. Reg. Ort. Bot. Palermo. **1**: 10. (1897).

Flowers very small (2 cm.), several (5–9) from one and the same somewhat enlarged and woolly areola; ovary naked; tube short funnel-shaped with a few minute scales; perianth leaves few, sepaloid brownish, petaloid white, linear-spatulate; filaments inserted near the base of the petals, exserted. Berry small, smooth, reddish brown.

Cereus (*Myrtillocactus*) *geometrizans* Mart. K. Sch. Monogr. 104. — Mexico, Baja California.

This plant is very common in cultivation, but generally in small specimens. It forms a small richly branched tree. A large plant flowers and fruits annually in the Botanic Garden at Palermo, upon which Console founded his genus. Also a small cutting flowered and fruited once at La Mortola.

The flowers, in size and color, resemble orange blossoms. The fruit is sold in Mexico. It is called Garambullos and is eaten raw with sugar or preserved.

IV. PACHYCEREUS A. Berg.

Ovary ovate to globose, densely covered with small imbricated scales and woolly hairs and bristles; petaloid perianth leaves short, spatulate, little expanded; stamens numerous, inserted along the tube; style not exserted. Fruit globose, densely covered with wool and numerous long, thin bristles. *Plate 1.*

Gigantic species. Some of these were wrongly included under *Pilocereus*. Similar to *Lepidocereus*, but easily distinguished by flower and fruit.

Cereus (*Pachycereus*) *Pringlei* Wats. l.c. 71. — Sonora, California, etc.
C. (*Pachycereus*) *pecten aboriginum* Engelm. l. c. 75. — Mexico, Sonora, Baja California.
C. (*Pachycereus*) *Thurberi* Engelm. l. c. 73. — Sonora, North Mexico.
C. (*Pachycereus*) *fulviceps* (Web.) A. Berg. l. c. 176. — Mexico.
C. (*Pachycereus*) *Orcuttii* Kath. Brand. l. c. Nachtr. 24. — Baja California.

C. Thurberi Engelm. (Cact. Bound. 44) has been considered by Engelmann as a *Lepidocereus*, but no doubt it is more closely related to *C. Pringlei* than to *C. giganteus*. The fruit is prickly, although the bristles soon fall off.

The flowers of *C. Pringlei* are covered with a fine and dense velvety yellowish tomentum. They are very unlike all other cactus flowers. The fruit of *C. Pringlei* is covered with a great number of neat balls of wool, which are somewhat deciduous. In *C. pecten aboriginum* the spines are more persistent, and for this reason the natives use them as hair brushes.

The drawing of the flower of *C. Pringlei* was prepared from a specimen kindly sent me by Herrn Geheimrat Prof. Dr. A. Engler, Director of the Royal Botanic Garden and Museum, Berlin.

V. OREOCEREUS A. Berg.

Ovary roundish, like the tube covered with fleshy acute imbricated scales, with long woolly hairs from their axils; sepaloid perianth leaves narrow, acute, petaloid ones narrowly spatulate, slightly expanded; stamens very numerous, inserted along the tube and at the bottom of it, as long as or longer than the petals; style much exserted, with about 8 short stigmata. Fruit globose, scaly and hairy (dried remains of the perianth persistent ?). — *Plate 2.*

Cereus (*Oreocereus*) *Celsianus* (Lem.) A. Berg. l. c. 180. — Andes of Bolivia.

Oreocereus forms part of the old genus *Pilocereus*.

Cereus Celsianus A. Berg. (=*Pilocereus Celsianus* Lem.) is a very stately plant, stout and vigorous, covered with long white hairs. There exist many varieties of it, chiefly differing in the spines and the more or less dense covering of hairs. It is quite hardy on the Riviera. There is a fine plant at La Mortola, from which the flower represented in plate 2 has been drawn.

It is very likely that the old *Cereus lanatus* P. DC. (*Cactus lanatus* HBK.) is also an *Oreocereus*. It has never flowered in Europe, and from the original description this is not quite evident. It is much grown in gardens as *Pilocereus Dautwitzii* Fr. A. Haage, and is a very fine plant, densely involved in long white hairs.

VI. LEPIDOCEREUS Engelm. Syn. of the Cact. of the Terr. of the U. S. etc. Proc. Am. Acad. **3**. (1856); Coll. Works. 140.

Flowers rather large, white; ovary oblong, with deltoid imbricated scales bearing in their axils very little short wool, and sometimes a few deciduous bristles; tube funnel-shaped with similar but gradually increasing scales, the inferior only woolly; sepaloid perianth leaves obovate, obtuse, green, petaloid ones white, recurved spatulate and very obtuse or notched; filaments very numerous, shorter; style with 12–18 stigmata. Fruit obovoid or pear-shaped, with small and remote deltoid scales, in their axils scarcely woolly, dried remains of the flower deciduous; pulp red; seeds small, very numerous, shining, black.

Cereus (*Lepidocereus*) *giganteus* Engelm. l. c. 76. — Arizona, Sonora, etc.

Engelmann states that *Cereus chilensis* Colla also belongs to his subgenus *Lepidocereus*, but according to the description of this species given by Schumann it is a *Trichocereus*.

The subgenus as established by Engelmann comprises also *C. Thurberi*, which I include under *Pachycereus*. There is no other *Cereus* known to me of which the flowers and fruits resemble those of *C. giganteus*.

The figure given in the Botanical Magazine, pl. 7222, differs somewhat from that of Engelmann, the latter having apparently been prepared from a dried specimen.

This gigantic plant has often been figured and described and has in later years frequently been introduced. It has flowered only once in Europe, in the Royal Botanic Gardens at Kew, in July, 1891. In its native land the fruits are much valued as food and the Indians preserve them like dried figs.

VII. STENOCEREUS A. Berg.

Flowers small (4–8 cm.), tubular, reddish or usually brownish; ovary globose with deltoid scales, naked or with a few setulose hairs and little wool; tube with elongate naked appressed scales; sepaloid and petaloid perianth leaves small, ovate-lanceolate; filaments little shorter, numerous, inserted in the middle of the tube, forming there a distinct ring; styles not exserted, with about 6–8 short stigmata. Fruit globose, (3–4 cm.), brownish, with reddish pulp. — *Plate 3.*

Chiefly Mexican species of columnar or frutescent growth. Type: *Cereus stellatus* Pfeiff.

Cereus (*Stenocereus*) *Chiotilla* Web. l. c. 83. — Mexico.
C. (*Stenocereus*) *Dumortieri* Salm. l. c. 92. — Mexico.
C. (*Stenocereus ?*) *marginatus* DC. l. c. 90. — Mexico.
C. (*Stenocereus*) *sonorensis* Runge. l. c. Nachtr. 27 (sub *C. stellatus* Pfeiff.!) — Sonora.
C. (*Stenocereus*) *stellatus* Pfeiff. l. c. 79. — Central Mexico.

The flowers of this subgenus are small and of a dull tint. The inner petals only are somewhat brighter. In some species (*C. stellatus*, *sonorensis*, *Chiotilla*) the flowers come from the highest areoles of the stems; in *C. Dumortieri* and *C. marginatus* they are lateral. In the latter they are said to come sometimes in pairs from one areole.

C. stellatus Pfeiff. flowers every year at La Mortola. *Cereus sonorensis* Runge is a distinct species, although Schumann united it with the first. *C. Alamosensis* Coult. is the juvenile form of the latter according to Mr. Weingart, of Nauendorf.

The flowers of *C. stellatus* Pfeiff. open fully only for a very short time. I have seen them open on a dark morning for about two hours, but otherwise failed to observe them expanded, and for a long time I believed them to be cleistogamous. Soon after flowering they fell off, producing no fruit. The lower part of the tube secretes much nectar, so much that it finally reaches the stamens or even fills the whole flower.

Cereus Aragoni Web., from western Costa Rica, seems also to belong to this subgenus according to the description of the flower given by Weber.* This plant is now cultivated in some gardens in Europe, and I am informed by Mr. Weingart, of Nauendorf, that it seems closely allied to *C. pruinosus* Otto and *C. eburneus* Salm. If this is true, these two species also may probably belong here. *C. resupinatus* Salm has also been united by Schumann with *C. eburneus*, but this is certainly a mistake. Mr. Weingart, of Nauendorf, possesses this plant, which agrees exactly with the figure (no. 93) in Förster-Rümpler.

It is not clear from the description whether *Pilocereus Tetetzo* Web. (K. Sch. l. c. 175) is also a *Stenocereus*.

VIII. EULYCHNIA Phil. Flor. Atac. 23. *pl. 11a.* (1861).

Flowers campanulate with a short and broad tube; ovary globose or turbiniform, like the tube with numerous deltoid or acute scales, often densely covered with wool, setulose hairs or bristles; sepaloid and petaloid perianth leaves small, reddish or white; filaments numerous, little shorter; styles deeply divided into numerous stigmata. Fruit globose, more or less woolly, setuliferous or prickly.—*Plate 4, f. 1.*

Frutescent or columnar species from the Andes of South America.

Philippi has given no clear definition of his genus. He founded it upon the very setuliferous flower of *C. breviflorus* K. Sch. and afterwards added to it two other species

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* Les Cactées de Costa Rica. Bull. Mus. d'Hist. Nat. Paris. No. VI. 455. (1902).

(*C. acidus* K. Sch. and *C. castaneus* K. Sch.) which have not such setulose hairs. But if we take as principal characters the short flower with small sepals and petals and the deeply divided style, the genus of Philippi can be kept up for a certain number of Andean species.

But I am quite aware that in this form the subgenus *Eulychnia* is more artificial than natural. For instance, *C. macrostibas* A. Berg. differs greatly from the rest, especially by its enlarged and prolonged flowering areoles, which seem to form real "Kurztriebe." But the material at hand is so scanty that I must refrain from any further statement. I shall be very grateful if some botanist of South America will supply me with further information concerning any of these plants.

Cereus macrostibas A. Berg. was originally described by Schumann as a *Pilocereus*, and as such it is another heterogeneous form of this conglomerate genus. The flowers are stated to be of the form of those of *C. Celsianus* A. Berg., but they differ in every possible way.

Cereus aureus K. Sch. was originally described by Pfeiffer as an *Echinocactus*. Indeed the short and campanulate flowers of *Eulychnia* are almost those of *Echinocactus*, and there remain only very faint distinctions between this subgenus of *Cereus* and *Echinocactus*. Generally in *Eulychnia* the petals are reddish or white, but in *C. aureus* they are golden yellow, hence it is probable that this may be better replaced in *Echinocactus*.

Cerus breviflorus K. Sch. has recently been collected by Dr. Otto Kuntze. His splendidly prepared specimens are now in the Royal Herbarium at Berlin, whence they were kindly lent me. The drawing was prepared from them. I am indebted to Mr. Stolp, of Santiago, Chile, for a photograph of the same plant.

The following species may be considered as belonging to *Eulychnia*: —

Cereus (*Eulychnia*) *acidus* K. Sch. l. c. Nachtr. 22. — Chile.
C. (*Eulychnia ?*) *aureus* K. Sch. l. c. 124. — Peru.
C. (*Eulychnia*) *breviflorus* K. Sch. l. c. 58. Nachtr. 23. — Chile.
C. (*Eulychnia*) *castaneus* K. Sch. l. c. Nachtr. 22. — Chile.
C. (*Eulychnia*) *Dusenii* Web. Monatsschrift f. K. 1904: 68. — Patagonia.
C. (*Eulychnia*) *erythrocephalus* (K. Sch.) A. Berg. l. c. 195. — Argentina.
C. (*Eulychnia*) *hypogaeus* Web. l. c. 289. Nachtr. 38. — Chile.
C. (*Eulychnia*) *iquiquensis* K. Sch. Monatsschrift f. K. 1904: 99. — Chile.
C. (*Eulychnia ?*) *macrostibas* (K. Sch.) A. Berg. Monatsschrift f. K. 1903: 168. — Peru.
C. (*Eulychnia*) *melanotrichus* K. Sch. l. c. 71. — Bolivia.
C. (*Eulychnia*) *patagonicus* Web. l. c. Nachtr. 61. — Patagonia.

IX. PILOCEREUS A. Berg.

Flowers short and campanulate, of a dull color and disagreeable smell; ovary and tube nearly naked or with a very few scales; sepaloid and petaloid perianth leaves short, little expanded; stamens numerous, inserted along the tube, as long as the perianth; style very often much exserted, rarely not exceeding the perianth, with 5–10 or more short stigmata. Fruit globular, naked, crowned by the dried remains of the flower. — *Plate 4, f. 2–5.*

The name *Pilocereus* was originally employed for *Cephalocereus.* These were separated by Schumann, whilst *Pilocereus* was made the recipient of any strange-looking *Cereus*, especially of those with hairy areoles. By degrees *Pilocereus* has become a very heterogeneous and senseless genus.

I maintain the name, as it is so much in vogue among cactus growers, for those species having the characters above given. In this way the subgenus becomes a very natural one.

Most of these species have hairy areoles, and sometimes hairs of a beautiful silky white. Frequently the flowers are surrounded by a great brush-like profusion of such hairs. In some species the flowers are produced from one side of the stem only, and so the appearance of a cephalium is presented.

They are all columnar, curious-looking plants and general favorites of cactus growers, but fine specimens are nevertheless extremely rare.

According to their descriptions, the following species form this subgenus: —

Cereus (*Pilocereus*) *chrysacanthus* (Web.) A. Berg. l. c. 178. — Mexico.
C. (*Pilocereus*) *exerens* Link. l. c. 184. — Brazil.
C. (*Pilocereus*) *Hermentianus* Monv. l. c. 186. Nachtr. 66. — Haiti.
C. (*Pilocereus ?*) *Hoppenstedtii* (Web.) A. Berg. l. c. 177. — Mexico.
C. (*Pilocereus*) *Houlletii* (Lem.) A. Berg. l. c. 182. — Mexico.
C. (*Pilocereus*) *lanuginosus* Mill. l. c. 183. — West Indies.
C. (*Pilocereus*) *Royeni* Haw. l. c. 181. — West Indies.
C. (*Pilocereus*) *strictus* P. DC. l. c. 188. — West Indies, South America.
C. (*Pilocereus*) *Ulei* (K. Sch.) A. Berg. l. c. Nachtr. 66. — Haiti.

Cereus Hoppenstedtii A. Berg. was formerly included by Schumann in *Cephalocereus*. I have never seen its flowers. The plant resembles *Cereus senilis* DC. much more closely than any *Pilocereus*.

X. PIPTANTHOCEREUS A. Berg.

Flowers naked, with a very few minute scales on the somewhat elongated ovary and scarcely any wool or hairs in their axils; tube elongated, funnel-shaped with a few remote obtuse scales, often slightly furrowed; sepaloid perianth leaves obtuse, the following acute; petaloid perianth leaves broader, acute, mostly white; stamens numerous in two groups; style as long or longer, with numerous stigmata; flowers large and showy, nocturnal, soon falling off a little above the ovary; style persistent. Fruit oblong or globose, naked, reddish, at the top deeply umbilicate, the remaining style bent downwards; pulp white; seeds numerous, with opaque, black, finely punctate testa. — *Plate 5, 6. 7, f. 1–4.*

Arborescent or frutescent species, natives of Atlantic tropical America from Argentina to the West Indies.

This is a very natural and easily recognizable subgenus. The perianths fall off, soon after flowering, a little above the ovary, as neatly as if they had been cut off. The style remains. The fruit is naked.

In drying, the flowers of *Piptanthocereus* invariably turn black, whilst others, for instance *Eucereus*, *Aporocactus*, etc., keep their beautiful colors for a long time in the herbarium.

The following species belong here: —

Cereus (*Piptanthocereus*) *azureus* Parm. l. c. 118. — Southern Brazil.
C. (*Piptanthocereus*) *Cavendishii* Monv. l. c. Nachtr. 40. — South America.
C. (*Piptanthocereus*) *chalybaeus* Otto. l. c. 120. — Argentina.
C. (*Piptanthocereus*) *coerulescens* Salm. l. c. 121. — Argentina.
C. (*Piptanthocereus*) *Forbesii* Otto. l. c. 111. — Argentina.
C. (*Piptanthocereus*) *euchlorus* Web. l. c. 84. — Brazil.
C. (*Piptanthocereus*) *Hankeanus* Web. l. c. 88. — Argentina.
C. (*Piptanthocereus*) *Hildmannianus* K. Sch. l. c. 110. — Brazil.
C. (*Piptanthocereus*) *Jamacaru* DC. l. c. 112. — Brazil.
C. (*Piptanthocereus*) *lamprospermus* K. Sch. l. c. Nachtr. 33. — Paraguay.
C. (*Piptanthocereus*) *lepidotus* Salm. l. c. 109. — Cuba.
C. (*Piptanthocereus*) *pachyrhizus* K. Sch. l. c. Nachtr. 33. — Paraguay.
C. (*Piptanthocereus*) *paraguayensis* K. Sch. l. c. Nachtr. 34. — Paraguay.
C. (*Piptanthocereus*) *Paxtonianus* Monv. l. c. 134. Nachtr. 40. — South America.
C. (*Piptanthocereus*) *peruvianus* Mill. l. c. 113. — Brazil, W. Indies, Mexico.
C. (*Piptanthocereus*) *phatnospermus* K. Sch. l. c. Nachtr. 43. — Paraguay.
C. (*Piptanthocereus*) *Pitahaya* DC. l. c. 116. — Brazil, Uruguay.
C. (*Piptanthocereus*) *Spegazzinii* Web. l. c. Nachtr. 42. — Paraguay.
C. (*Piptanthocereus*) *stenogonus* K. Sch. l. c. Nachtr. 31. — Paraguay.
C. (*Piptanthocereus*) *tetragonus* Haw. l. c. 86. — Brazil.
C. (*Piptanthocereus*) *xanthocarpus* K. Sch. l. c. Nachtr. 32. — Paraguay.

The flower and large fruit of plate 6 are from the tall *Cereus* represented by the photograph of plate 5. This plant is one of the most remarkable specimens of this family on the Riviera. It stands in the garden of the Casino at Montè Carlo. Flowers and fruits were sent to me by the Director of this garden, Mr. Van den Daelen. The same plant has been figured in the Monatsschrift für Kakteenkunde, 1900, p. 7, under the name of *Cereus peruvianus*. At Monte Carlo it is named *Cereus validus* Haw.

The species of *Piptanthocereus* are however not enough known, and I cannot give exact names either of this plant or of the other which produced the smaller fruit shown in plate 7.

Mr. Weingart, of Nauendorf, has undertaken the task of studying the different species of *Cereus*, and, according to him, many of the species of older botanists, which were reduced to synonyms, will prove to be true species.

XI. HYLOCEREUS A. Berg.

Flowers funnel-shaped, very large and showy, white or red: ovary and tube with more or less large, often foliaceous scales, without wool, hairs or spines; sepaloid and petaloid perianth leaves numerous; stamens numerous, in two groups; style with numerous stigmata. Fruit roundish, covered with large, often foliaceous scales; pulp white or red; seeds large.

Cereus (*Hylocereus*) *extensus* Salm. l. c. 161. — Trinidad.
C. (*Hylocereus*) *Lemairei* Hook. l. c. 160. — Antigua Island.
C. (*Hylocereus*) *Napoleonis* Grah. l. c. 159. — Antilles.
C. (*Hylocereus*) *Ocamponis* Salm. l. c. 159. — Mexico.
C. (*Hylocereus*) *stenopterus* Web. l. c. Nachtr. 57. — Costa Rica.
C. (*Hylocereus*) *triangularis* Haw. l. c. 157. — Mexico.
C. (*Hylocereus*) *trigonus* Haw. l. c. 158. — Puerto Rico.
C. (*Hylocereus*) *trigonus* var. *costaricensis* Web. l. c. Nachtr. 56. — Costa Rica.

A very natural subgenus comprising the Triangulares of Schumann with the exception of *Cereus setaceus* Salm. They are all climbers and produce roots along their triangular stems. The nocturnal flowers are among the largest and the most beautiful of the whole genus. The fruit is large, red, and furnished with foliaceous scales, which increase in size during the growth of the fruit

Cereus triangularis Haw. is much grown on the Riviera and flowers every year, but as yet I have not seen any fruit from these plants.

Cereus trigonus var. *costaricensis* Web. is much grown for its fruit in Costa Rica. There is a fine drawing of it at La Mortola.

XII. TRICHOCEREUS A. Berg.

Ovary and tube with more or less densely imbricated acute scales, from the axils of which rise long and curled or woolly hairs in great profusion, but no bristles; sepaloid and petaloid perianth leaves numerous; stamens numerous, in two groups; style as long or longer with numerous stigmata. Fruit uncolored, roundish, scaly and hairy, with the dried remains of the flowers more or less persistent.

Flowers showy, nocturnal, white, yellowish or red, trumpet-shaped.—*Plate 8, f. 1–3.*

Chiefly Andean species: —

Cereus (*Trichocereus*) *andalgalensis* Web. l. c. 168. — Argentina.
C. (*Trichocereus*) *Bridgesii* Salm. l. c. 107. — Bolivia.
C. (*Trichocereus*) *candicans* Gill. l. c. 69. — Argentina.
C. (*Trichocereus*) *chilensis* Colla. l. c. 61. — Chile.
C. (*Trichocereus*) *fascicularis* Meyen. l. c. 57. — Peru.
C. (*Trichocereus*) *Huascha* Web. l. c. 70. — Argentina.
C. (*Trichocereus*) *lamprochlorus* Lam. l. c. 60. — Argentina.
C. (*Trichocereus*) *macrogonus* Salm. l. c. 115. — Andes ?
C. (*Trichocereus*) *nigripilis* Phil. l. c. Nachtr. 20. — Chile.
C. (*Trichocereus*) *Pasacana* Web. l. c. 77. — Argentina.
C. (*Trichocereus*) *pterogonus* Lem. l. c. 152. — New Granada.
C. (*Trichocereus*) *Spachianus* Lem. l. c. 67. — Argentina.
C. (*Trichocereus*) *strigosus* Salm. l. c. 68. — Argentina.
C. (*Trichocereus*) *thelegonus* Web. l. c. 78. — Argentina.

The description of the flower of *Cereus macrogonus* Salm in K. Schumann's Monographia is not correct; see Monatsschrift für Kakteenkunde, 1904, p. 190.

Cereus andalgalensis Web. is the same as *Cereus Huascha* Web. var. *rubriflora* Web., as I have been informed by Weber himself.

The genus *Echinopsis* comes so near to this subgenus that there seems to be no obstacle, except for its seeds, to reuniting it with *Cereus*, as done by Pfeiffer and Otto, and by Bentham and Hooker (Gen. Plant. **1**: 849). *Cereus candicans* Gill. and *C. lamprochlorus* Lem., on the other hand, have been considered by Weber as *Echinopses*. *Echinopsis obrepanda* K. Sch., *E. cinnabarina* Lab. and *E. Pentlandii* Salm, have been included by other authors under *Echinocactus*.

XIII. ERIOCEREUS A. Berg.

Ovary roundish with deltoid acute scales; tube with similar but larger and more remote scales, in their axils with more or less copious white wool, on the ovary sometimes with a few spines; sepaloid perianth leaves acute, greenish brown; petaloid ones white; stamens numerous, in two groups. Fruit roundish, with the dried remains of the flower more or less persistent, red, with the pulvilli more or less raised, scales often a little increased, with wool and often spines in their axils; pulp white, seeds numerous, black, opaque, compressed, strongly papillous along the crest. —*Plate 7, f. 5–6; plate 9, f. 1; plate 10.*

This subgenus comprises most of the Tortuosi of K. Schumann. It approaches *Eucereus*, from which, however, it is distinguished by the larger scales of the ovary and by the white wool of the pulvilli and tube. The tube is never armed with bristles except in *Cereus Martinii* Lab. Stems of the species mostly procumbent. Fowers showy, white, nocturnal, very uniform. *Cereus tortuosus* Forb. may be considered the type of this subgenus.

Cereus (*Eriocereus*) *Bonplandii* Parm. l. c. 135. — Paraguay.
C. (*Eriocereus*) *Jusberti* Rebut. l. c. 137. — ?
C. (*Eriocereus*) *Martinii* Lab. l. c. 141. — Argentina.
C. (*Eriocereus*) *pomanensis* Web. l. c. 136. — Argentina.
C. (*Eriocereus*) *repandus* Haw. l. c. 94. — Antilles ?
C. (*Eriocereus*) *tephracanthus* Lab. l. c. 80. — Bolivia.
C. (*Eriocereus*) *tortuosus* Forb. l. c. 139. — Argentina.

Cereus Jusberti Rebut is, according to repeated assurances of Abbé Beguin, a hybrid between an *Echinopsis* and a *Cereus*, raised by him.

All these plants are quite hardly at La Mortola and flower annually. *Cereus tortuosus* Forb. produces its beautiful flowers in great quantity every summer and ripens many fruits, from which this species has been widely distributed. *Cereus pomanensis* Web. comes very near to it, but has an unarmed fruit. The form of the seeds of *Eriocereus* is very characteristic.

XIV. EUCEREUS Engelm. Syn. of the Cact. of the Terr. of the U. S. etc., Proc. Am. Acad. 3. (1856); Coll. Works. 139; Cact. Bound. 40.

Ovary and tube with numerous small deltoid acute scales, those of the tube larger and remote; from the axils of all of them rise hairs, wool and setulose, more or less stiff bristles; tube funnel-shaped, rather slender; perianth leaves numerous. Fruit more or less roundish and reddish, covered with spines often in deciduous clusters.—*Plate 11; plate 12, f. 1.*

The numerous species falling under *Eucereus* easily group themselves in a few natural subsections, which are given below: —

Subsection I. NYCTOCEREUS A. Berg.

Stems more or less upright, cylindrical, ribbed. Flowers nocturnal.

The following species seem to belong here: —

Cereus (*Nyctocereus*) *bavosus* Web. l. c. 84. — Mexico.
C. (*Nyctocereus ?*) *candelabrum* Web. l. c. 106. — Mexico. (Description too poor.)
C. (*Nyctocereus*) *Cumengei* Web. l. c. 85. — Baja California.
C. (*Nyctocereus*) *Eruca* Brandg. l. c. 125. — Baja California.
C. (*Nyctocereus*) *gummosus* Engelm. l. c. 124. — Baja California.
C. (*Nyctocereus*) *Hirschtianus* K. Sch. l. c. 130. — Nicaragua.
C. (*Nyctocereus ?*) *multangularis* Haw. l. c. 66. — Peru ?
C. (*Nyctocereus*) *nesioticus* K. Sch. l. c. Nachtr. 37. — Galapagos Islands.
C. (*Nyctocereus*) *Neumanni* K. Sch. l. c. Nachtr. 37. — Nicaragua.
C. (*Nyctocereus*) *queretaroensis* Web. l. c. 83. — Mexico.
C. (*Nyctocereus*) *serpentinus* P. DC. l. c. 129. — Mexico.

Cereus serpentinus P. DC. possesses the largest seeds of *Cereus* known to me. There are only a few in each fruit, bedded in the crystalline red pulp. Several varieties of this species occur in gardens. There are two very pronounced forms at La Mortola. One has weaker and more serpentine stems, with smaller spines and smaller flowers. This never produces any fruit. The other form has stronger, upright stems with longer spines. Its flowers are remarkably larger and produce a great quantity of fruits. The former variety seems to have undeveloped stigmata, and it may prove to be the male plant. Similar cases of heterogamy are known in *Opuntia* and *Mamillaria*, but nothing of the kind has ever been shown in *Cereus*. This male form at La Mortola corresponds well with the figure in the Botanical Magazine, pl. 3566. Strictly terminal flowers, as shown in this plate, are also occasionally produced by our plant.

Cereus Martianus Zucc. is generally considered as an ally of *Cereus flagelliformis* Mill. Its flowers, however, are those of *Eucereus;* the tube bears bristles. Its position in *Eucereus* still remains doubtful. — *Plate 12, f. 1.*

Subsection II. SELENICEREUS A. Berg.

Stems slender, elongated, sarmentose, rooting. Flowers nocturnal, always very large; ovary mostly (not always) with long hairs and bristles.

Cereus (*Selenicereus*) *Böckmannii* Otto. l. c. 147. — Cuba.
C. (*Selenicereus*) *calcaratus* Web. l. c. Nachtr. 54. — Costa Rica.
C. (*Selenicereus*) *coniflorus* Weingart. in Monatsschr. f. K. 1904: 118. — Haiti ?
C. (*Selenicereus*) *Donkelaeri* Salm. l. c. 150. — Brazil.
C. (*Selenicereus*) *grandiflorus* Mill. l. c. 144. — Haiti.
C. (*Selenicereus*) *hamatus* Scheidw. l. c. 155. — Mexico.
C. (*Selenicereus*) *hondurensis* K. Sch. Weingart in Monatsschr. f. K. 1904: 147. — Honduras.
C. (*Selenicereus*) *inermis* Otto. l. c. 156. — Venezuela.
C. (*Selenicereus*) *Kunthianus* Otto. l. c. 150. — Honduras.
C. (*Selenicereus*) *MacDonaldiae* Hook. l. c. 149. — Honduras?
C. (*Selenicereus*) *miravallensis* Web. l. c. Nachtr. 49. — Costa Rica.
C. (*Selenicereus*) *nycticalus* Link. l. c. 146. — Haiti, Mexico.
C. (*Selenicereus*) *spinulosus* P. DC. l. c. 148. — Mexico.
C. (*Selenicereus*) *setaceus* Salm. l. c. 162. — Brazil.

This subsection comprises the Principales and Rostrati of K. Schumann. In some of the flowers bristles are wanting, and for this reason they would come in close contact with *Trichocereus*, but their long slender tube removes all doubt as to their true relationship. *Cereus setaceus* Salm has a somewhat isolated position. The flower is far less hairy, and the stems, when adult, are triangular. For this reason it is generally placed under the Triangulares, but the prickly fruit and the setuliferous tube of the flowers remove it far from those species.

Most of the species of *Selenicereus* are garden plants, much grown for the sake of their beautiful nocturnal flowers, which sometimes have a delicious scent, as for instance those of *C. grandiflorus* Mill., the well-known "Queen of the Night." *Cereus MacDonaldiae* Hook. has about the largest flowers.

Subsection III. PENIOCEREUS A. Berg.

Rootstock tuberous, stems slender. Flowers with a long narrow tube, nocturnal, white or red.

Cereus (*Peniocereus*) *Greggii* Engelm. l. c. 96. — Texas, North Mexico.

C. (*Peniocereus*) *striatus* Brandg. l. c. 134. (= *C. Diguettii* Web. l. c. 30 ?). — Baja California.

Of these two (or three?) species, *C. Greggii* Engelm. is the best known plant. It flowered last summer at La Mortola (see Monatsschrift für Kakteenkunde, 1904, p. 134). The stems are covered with short velvety hairs. The tube of the flower is broader than in Engelmann's excellent plates (Cact. Bound. pl. 63, 65).

Subsection IV. ACANTHOCEREUS Engelm. in Additions to the Cactus Flora etc.; Coll. Works. 225.

Stems elongated, 3–4-angled. Flowers white, nocturnal; tube with a few scales and stiff bristles.

Cereus (*Acanthocereus*) *Baxaniensis* Karw. l. c. 98. (= *C. princeps* Hort. = *C. acutangulus* Otto = *C. variabilis* Engelm.). — Central America.

Cereus Baxaniensis Karw. is a very variable plant, a fact which accounts for the numerous synonyms under which it has been described by different authors. Young plants further differ greatly from fully grown specimens. *Cereus Dussii* K. Schumann l. c. 89 is the same plant.

Subsection V. HELIOCEREUS A. Berg.

Stems more or less upright, 3-4-angled. Flowers red or white, diurnal.

Cereus (*Heliocereus*) *amecaensis* Heese. l. c. 154. — Mexico.
C. (*Heliocereus*) *coccineus* Salm. l. c. Nachtr. 53. — Mexico.
C. (*Heliocereus*) *Schrankii* Zucc. l. c. Nachtr. 52. — Mexico.
C. (*Heliocereus*) *speciosus* K. Sch. l. c. 153. — Mexico.

These few species are very closely related.

The *Heliocerei* are much grown for the sake of their most brilliant flowers, especially *C. speciosus*. This latter species has given origin to many of the much admired hybrids with *Phyllocactus*.

Subsection VI. PHYLLOCEREUS A. Berg.

Epiphytic, climbing, stems flat resembling those of *Phyllocatus*. Flowers large with hairs and bristles similar to those of Subsection II. *Selenicereus*.

Cereus (*Phyllocereus*) *Wittii* K. Sch. l. c. Nachtr. 50. — Brazil.

This is a most interesting *Cereus*. The numerous and densely set areoles along the borders are armed with small bristles. It forms a beautiful connecting link with *Phyllocactus*, though it doubtless belongs to *Cereus*.

If anyone wishes to reunite *Phyllocactus* with *Cereus*, it ought to be placed here as a subgenus next to *Eucereus-Phyllocereus*.

Weber has described a *Phyllocactus lepidocarpus* from Costa Rica, which has the ovary and the fruit densely covered with scales. This would be a transition from *Phyllocactus* to *Phyllocereus*.

XV. LEPTOCEREUS A. Berg.

Flowers short, turbinate-campanulate, fleshy; ovary and tube with short scales with wool and clusters of bristles upon the pulvilli; perianth leaves rather short, little expanded; stamens numerous from the middle of the thickened tube; style as long as the perianth, with 5–6 short styles.

Tropical *Cerei* with short flowers and climbing, elongated stems form this subgenus. *Cereus assurgens* Griseb. may be considered the type.

Cereus (*Leptocereus*) *assurgens* Griseb. l. c. 140. — Cuba.
C. (*Leptocereus*) *Gonzalezii* Web. l. c. Nachtr. 58. — Costa Rica.
C. (*Leptocereus*) *Tonduzii* Web. l. c. Nachtr. 59. — Costa Rica.

A *Cereus Weingartianus* Hartmann has lately been published, but Weingart himself recognized it to be the old *C. assurgens* Griseb. (See Monatsschrift für Kakteenkunde, 1904: 155, and 1905: 8).

XVI. ECHINOCEREUS Engelm. in Wisliz. Tour North. Mexico. 91. (1848).

Flowers diurnal, short, rarely tubular; ovary and tube with woolly and prickly pulvilli; sepaloid and petaloid perianth leaves numerous and showy, mostly patent; stamens numerous, inserted along the tube. Style longer, ending in short green stigmata. Fruit round, reddish or green, aculeate; seeds small, obovate or subglobose, compressed, punctate.

A very natural subgenus and easily recognized.

Subsection I. GRACILES Engelm.

Cereus (*Echinocereus*) *tuberosus* Poselg. l. c. 249. — Texas etc.

Subsection II. SUBINERMES K. Sch.

Cereus (*Echinocereus*) *Knippelianus* (Liebn.) A. Berg. l. c. 251. — Mexico.
C. (*Echinocereus*) *pulchellus* Pfeiff. l. c. 252. — Mexico.
C. (*Echinocereus*) *subinermis* Hemsl. l. c. 250. — Mexico.

Subsection III. PROSTRATI K. Sch.

1. *Melanochlori* K. Sch.

Cereus (*Echinocereus*) *Salm-Dyckianus* Web. l. c. 255. — Mexico.
C. (*Echinocereus*) *Scheeri* Salm. l. c. 253. — Mexico.

2. *Nigricantes* K. Sch.

Cereus (*Echinocereus*) *Berlandieri* Engelm. l. c. 256. — Texas, Mexico.
C. (*Echinocereus*) *Blankii* Poselg. l. c. 257. — Mexico.
C. (*Echinocereus*) *papillosus* (A. Lke.) A. Berg. l. c. 258. — Texas.
C. (*Echinocereus*) *Poselgerianus* (A. Lke.) A. Berg. l. c. 257. — Mexico.

3. *Pentalophi* Salm.

Cereus (*Echinocereus*) *leptacanthus* Salm. l. c. 260. — Mexico.
C. (*Echinocereus*) *procumbens* Engelm. l. c. 259. — Mexico.

4. *Oleosi* K. Sch.

Cereus (*Echinocereus*) *glycimorphus* (Först.) A. Berg. l. c. 261. — Mexico.

5. *Leucacanthi* K. Sch.

Cereus (*Echinocereus*) *cinerascens* P. DC. l. c. 262. — Mexico.
C. (*Echinocereus*) *Ehrenbergii* Pfeiff. l. c. 262. — Mexico.
C. (*Echinocereus*) *enneacanthus* Engelm. l. c. 264. — Texas, Mexico.
C. (*Echinocereus*) *Leonensis* (Maths.) A. Berg. l. c. 263. — Mexico.

Subsection IV. ERECTI K. Sch.

1. *Pectinati* K. Sch.

Cereus (*Echinocereus*) *ctenoides* Engelm. l. c. 269. — Texas, Mexico.
C. (*Echinocereus*) *chloranthus* Engelm. l. c. 266. — Texas, New Mexico.
C. (*Echinocereus*) *dasyacanthus* Engelm. l. c. 268. — Texas.
C. (*Echinocereus*) *longisetus* Engelm. l. c. 265. — Mexico.
C. (*Echinocereus*) *pectinatus* Engelm. l. c. 270. — Mexico, S. W. U. S.
C. (*Echinocereus*) *Roetteri* Engelm. l. c. 272. — Texas, Arizona, Mexico.
C. (*Echinocereus*) *viridiflorus* Engelm. l. c. 267. — U. S.

2. *Decalophi* Salm.

Cereus (*Echinocereus*) *acifer* Otto. l. c. 286. — Mexico.
C. (*Echinocereus*) *conglomeratus* (Först.) A. Berg. l. c. 278. — Mexico.
C. (*Echinocereus*) *dubius* Engelm. l. c. 276. — Texas, Mexico.
C. (*Echinocereus*) *Engelmannii* Parry. l. c. 275. — Southwest U. S.
C. (*Echinocereus*) *Fendleri* Engelm. l. c. 274. — New Mexico, Sonora, Arizona, etc.
C. (*Echinocereus*) *Leeanus* Hook. l. c. 287. — Mexico.
C. (*Echinocereus*) *maritimus* Jones. l. c. 273. — California.
C. (*Echinocereus*) *Merkeri* (Hildm.) A. Berg. l. c. 277. — Mexico.
C. (*Echinocereus*) *mojavensis* Engelm. & Bgl. l. c. 279. — New Mexico, Arizona, California.
C. (*Echinocereus*) *paucispinus* Engelm. l. c. 280. — Texas, New Mexico, etc.
C. (*Echinocereus*) *phoeniceus* Engelm. l. c. 282. — Colorado, New Mexico, Arizona, Sonora, etc.
C. (*Echinocereus*) *polyacanthus* Engelm. l. c. 285. — Mexico, Texas, California, etc.
C. (*Echinocereus*) *Roemeri* Engelm. l. c. 284. — Texas, New Mexico, Utah.
C. (*Echinocereus*) *stramineus* Engelm. l. c. 273. — Mexico, Texas, Arizona, etc.

There is no reason to keep *Echinocereus* as a distinct genus, unless one accepts as genera the other subgenera as well. Engelmann, Kew Index, Coulter and Weber report it as a subgenus only.

The position of *Cereus Emoryi* Engelm. (*Echinocereus Emoryi* Rümpl.) remains still doubtful. I have not yet seen a flower of it.

XVII. CLEISTOCACTUS Lem. in Illustr. Hort. 8. (1861). Misc. 35. (as genus).

Flowers short and narrowly tubular, curved in the shape of an ∽, and the limb somewhat zygomorphic; ovary subglobose, like the tube with numerous small appressed scales, bearing woolly hairs in their axils; sepaloid and petaloid perianth leaves small, lanceolate, hardly expanded; filaments inserted below the middle of the tube, somewhat exserted and grouped together near the upper lip; style little longer. Fruit globular, small, red, with remote small scales and little wool, crowned with the dried remains of the flower; pulp white; seeds small, glossy black, slightly punctate. — *Plate 9, f. 2–5; 12, f. 2.*

Lemaire founded his genus upon

Cereus (*Cleistocactus*) *Baumannii* Lem. l. c. 133. — Uruguay, Paraguay.

Perhaps also *C. hyalacanthus* K. Sch., from Argentina, *C. laniceps* K. Sch. and *C. parviflorus* K. Sch., both from Bolivia, may belong here.

C. Baumannii var. *smaragdiflora* Web. is said to have regular flowers. I have not yet seen it, and perhaps it does not even belong to *C. Baumannii* Lem., but may be a different species.

Cleistocactus is a very natural subgenus, as can be seen from the flower and fruit represented in the plates. It is surprising that it has met with so many objections.

XVIII. APOROCACTUS Lem. in Illustr. Hort. 7. (1860). Misc. 67. (as genus).

Flower small, bright red; ovary globose, densely covered with deltoid scales and long, somewhat firm white hairs; tube slender, slightly bent upwards above the ovary, with sepaloid linear-lanceolate acute and patent perianth leaves, the inferior with a few hairs and smaller, the upper increasing in size; petals broader, acute, zygomorphically bent upwards and downwards, nearly forming 2 lips; filaments inserted near the base of the tube, exserted; style longer, with 5–7 red stigmata. Fruit globose, small, reddish, squamose and setose; pulp greenish yellow; seeds not very numerous, reddish brown, obovate.

This also is a very natural subgenus. It comprises the Flagriformes of K. Schumann with the exception of *C. Martianus* Zucc., which in spite of its slender stems and small red flowers is a true *Eucereus*.

Cereus (*Aporocactus*) *flagelliformis* Mill. l. c. 142. — Mexico.
C. (*Aporocactus*) *flagriformis* Zucc. l. c. Nachtr. 46 — Mexico.
C. (*Aporocactus*) *leptophis* DC. l. c. Nachtr. 47. — Mexico.

Cereus Kerberi K. Sch. from Mexico is stated to have flowers of the form of *Cereus flagelliformis* Mill. Certainly it does not belong to *Aporocactus*, and perhaps it is a *Eucereus* of the subsection *Heliocereus*, to judge from the quadrangular stems.

These small and graceful plants with their slender, dependent stems are very showy when well grown and in full flower.

There remain a great number of species of *Cereus* and "*Pilocereus*" of which the systematic position is still quite uncertain, as little or nothing is known about their flowers and fruit. I refrain from giving a list of them, as it would needlessly lengthen this paper.

Species to be excluded: —

Cereus obtusangulus K. Sch. in Flor. Brasil. 198; Monogr. Cact. 127.— *Epiphyllum obtusangulum* G. A. Lindberg, ex K. Sch. l. c.

This very strange little plant, still rare in cultivation, cannot be considered either a *Cereus* or an *Epiphyllum*. But no doubt it is much more nearly allied to the latter than to the former genus. Schumann brought it into *Cereus* on account of its round and ribbed stems, but there exists no *Cereus* of a similar articulated growth; only with *Rhipsalis* and *Epiphyllum* can it be compared. The plant resembles somewhat a minute *Platyopuntia*. The joints are slightly flattened and have numerous little prominent areoles distributed spirally all over the surface. In this it differs greatly from *Epiphyllum*, with which it agrees in all the characters of the flowers, the angular nearly alate ovary and especially in the inner stamens being united at the base into a small incurved membrane. Also, the fruit resembles more that of an *Epiphyllum* than of a *Cereus*. The flowers rise from the top of the joints as in *Ephiphyllum*. The plant is best considered as generically different from both, but must be placed with *Ephiphyllum* and *Rhipsalis* among the Inarmatae of K. Schumann. I propose for it the name

Epiphyllanthus obtusangulus (G. A. Lindbg.) A. Berg. —Brazil.

Imperfect as this paper may be, I shall be glad if it draws the attention of other botanists to these plants. They are full of interest in many a point and there remains much to be done. The facts as here stated all need careful verification. I wish them to be considered as an attempt only, for the material from which these statements have been derived has not been at all sufficient. Botanists who have the opportunity will find ample field for observation. The cacti of the United States and Mexico are pretty well known, but those of Central and South America and of the islands quite insufficiently. Furthermore, in the study of these plants, there are observations still to be made upon their pollination, on the opening of the fruits and dissemination, on the development from the seed to the full-grown plant, and on the geographical distribution and economic value of the different species, etc.

Cacti, as well as other succulent plants, can never be understood unless they can be studied from a large collection in a subtropical garden, where they are grown in quantities in the open and where every possibility is offered for their natural development. But at present there exists no such opportunity.

My grateful acknowledgments and thanks are extended to Sir Thomas Hanbury, who has always taken great interest in my studies of succulents and has given me every possible help. I further have to thank Herrn Geheimrat Engler for valuable herbarium specimens lent me from the Royal Botanical Museum in Berlin; the Herbier Boissier; and, last but not least, Dr. William Trelease for so kindly providing for the publication of this paper.

EXPLANATION OF PLATES.

Plate 5 is from a photograph by the author, and plate 12 from photographs by Mr. E. Dams, of Berlin. The other illustrations are from the author's drawings.

Plate 1. — PACHYCEREUS: *Cereus Pringlei* Wats. — 1, Flower, natural size. 2. Flower, longitudinal section (from specimens collected by Pringle, in the Royal Herbarium at Berlin). 3 Fruit (after K. Schumann). 4, Seeds, natural size and enlarged.

Plate 2. — OREOCEREUS: *Cereus Celsianus* A. Berg. — 1, Flower. 2, Flower, longitudinal section; both natural size. From La Mortola, Ventimiglia, Italy.

Plate 3. — STENOCEREUS: *Cereus stellatus* Pfeiff. — 1, Flower. 2, Flower, longitudinal section; both natural size. 3, Scale from the ovary, enlarged. 4, Petal, natural size. From La Mortola. — *Cereus sonorensis, Runge.* — 5, Flower (after K. Schumann).

Plate 4. — EULYCHNIA: *Cereus breviflorus* K. Sch. — 1, Flower, longitudinal section, natural size (from Dr. Kuntze's specimen in the Royal Herbarium at Berlin). PILOCEREUS: *Cereus strictus* P. DC. — 2, Flower (after plate 3125, Botanical Magazine, as *C. Royenii*). — *Cereus Houlletii* A. Berg. — 3, Flower, longitudinal section (after K. Schumann). 4, Fruit, reduced (after Rümpler). — *Cereus lanuginosus* Mill. — 5, Seeds, natural size and enlarged.

Plate 5. — PIPTANTHOCEREUS: *Cereus* spec.? (*C. validus* Haw.?). Plant in the garden at Monte Carlo.

Plate 6. — PIPTANTHOCEREUS: *Cereus* spec.? (*C. validus* Haw.?). — 1, Flower, closed, × 3/5. 2, Fruit, with spines from the stem attached, × 3/5. 3, The same, longitudinal section. 4, Seeds, × 3/5, and enlarged. From Monte Carlo.

Plate 7. — PIPTANTHOCEREUS: *Cereus Pitahaya* DC. — 1, Sterile fruit, with spines from the stem attached, natural size (from L. Winter's gardens, at Bordighera). — *Cereus* spec.? (*C. Jamacaru* DC.?). — 2, Fruit, natural size. 3, The same, longitudinal section. 4, Seeds, natural size and enlarged. ERIOCEREUS: *C. pomanensis* Web. — 5, Fruit, natural size. 6, Seeds, natural size, and enlarged. All from La Mortola.

Plate 8. — TRICHOCEREUS: *Cereus strigosus* Salm. — 1, Flower, natural size. — *Cereus Spachianus* Lem. — 2, Fruit, natural size. 3, Seeds, natural size, and enlarged. From La Mortola. LOPHOCEREUS: *Cereus Schottii* Engelm. — 4, Flower, natural size. 5, Ovary and base of tube, showing insertion of stamens, natural size. 6, Fruit, natural size (4, 5, 6 from specimens collected by Pringle, in the Royal Herbarium at Berlin). 7, 8, Seeds, natural size and enlarged.

Plate 9. — ERIOCEREUS: *Cereus tortuosus*. — 1, Flower, natural size. From La Mortola. CLEISTOCACTUS: *Cereus Baumannii* Lem. — 2, Fruit,

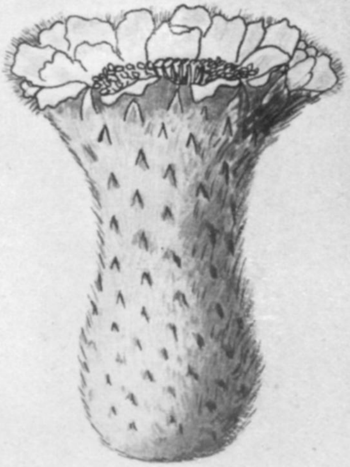
natural size. 3, Fruit, longitudinal section, natural size. 4, Seeds, natural size, and enlarged. 5, Part of testa, enlarged. From L. Winter's gardens, Bordighera.

Plate 10. — ERIOCEREUS: *C. Martinii* Lab. — 1, Fruit, natural size. 2, Seeds, natural size and enlarged. — *C. Bonplandii* Parm. — 3, Fruit, natural size. 4, Seeds, natural size and enlarged. From La Mortola.

Plate 11. — EUCEREUS: *Cereus serpentinus* P. DC. — 1, Flower, 2, Fruit, 3, Seed (from La Mortola). — *Cereus hamatus* Scheidw. — 4, Fruit (after K. Schumann). 5, Seeds. All × 5/9, except the enlarged seed of f. 5.

Plate 12. — EUCEREUS: 1, *Cereus Martianus* Zucc. CLEISTOCACTUS: 2, *Cereus Baumannii* Lem.

LA MORTOLA, VENTIMIGLIA, ITALY.



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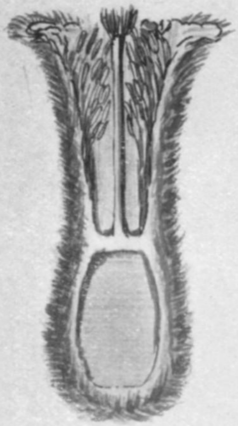

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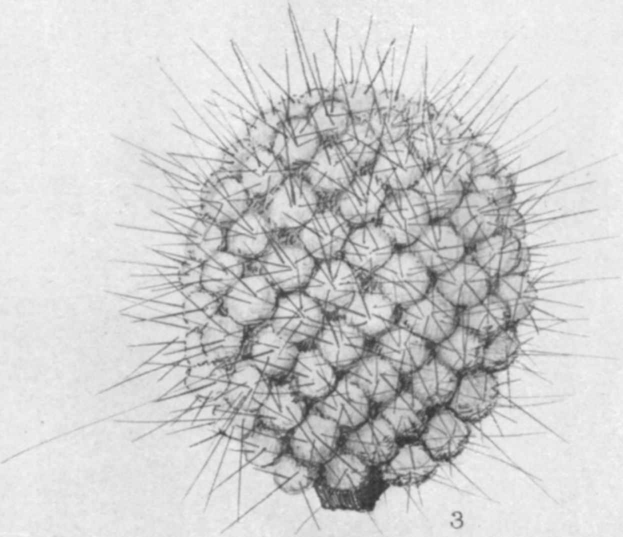

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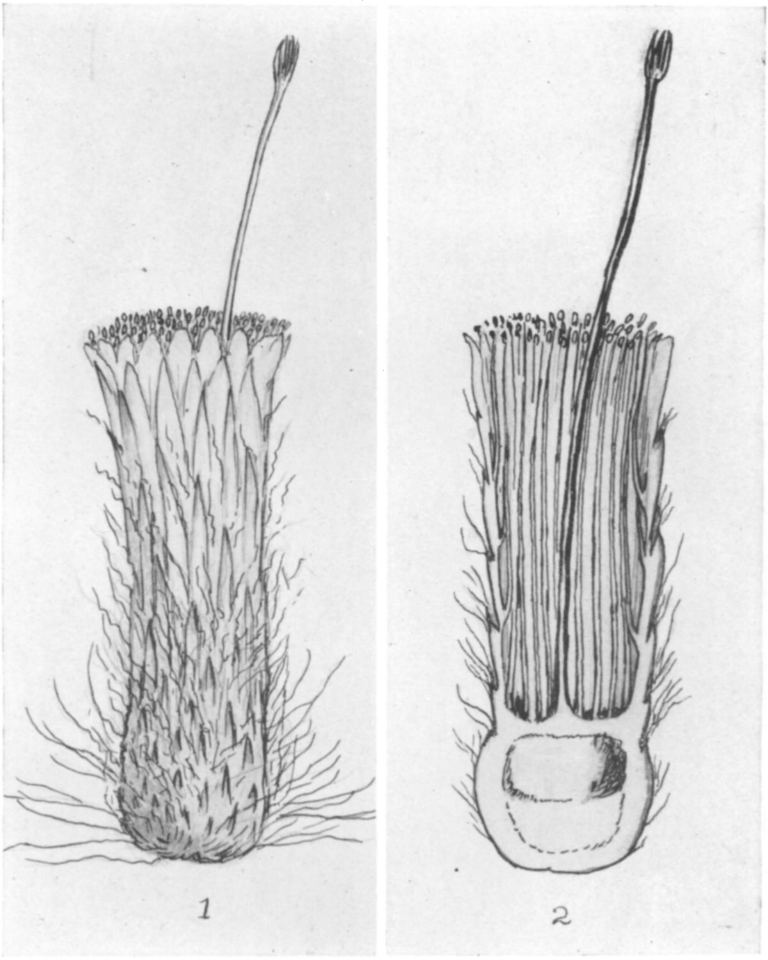
CEREUS.—IV. PACHYCEREUS.



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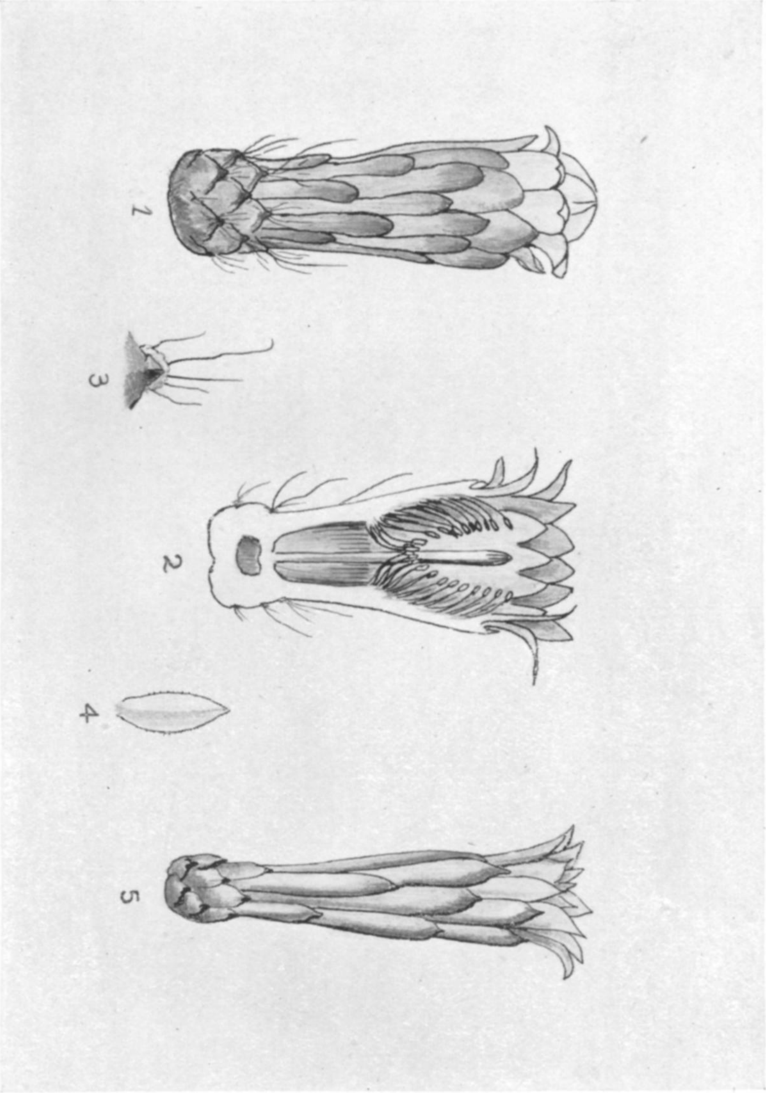

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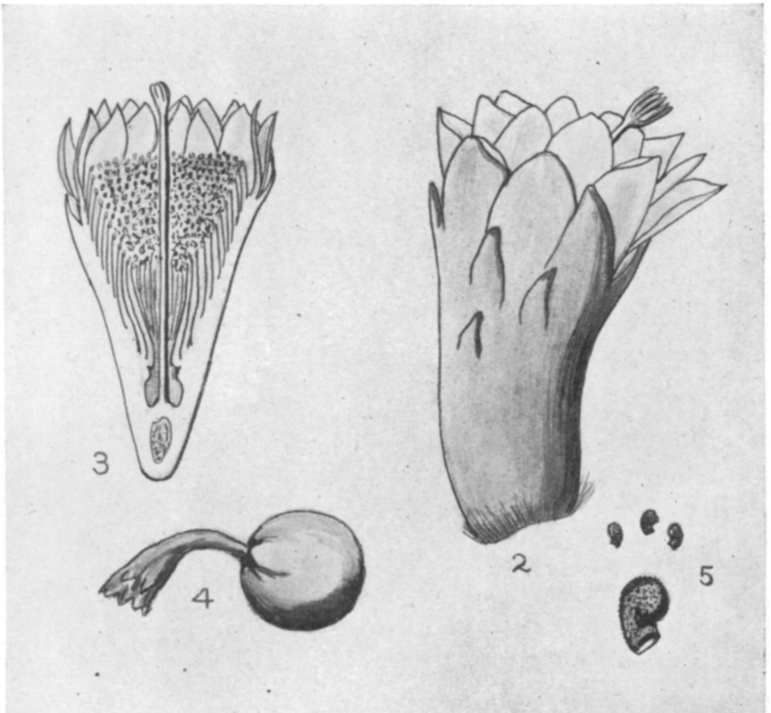
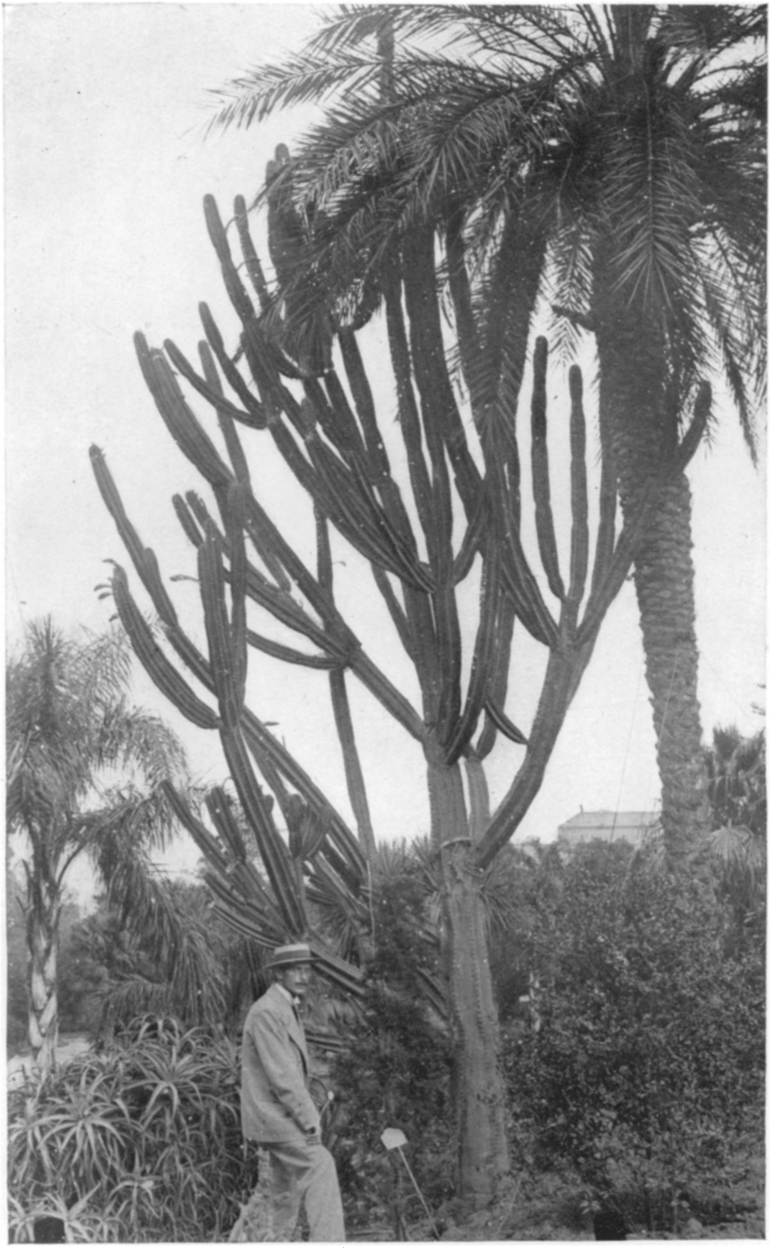


CEREUS.—VIII. EULYCHNIA: IX. PILOCEREUS.



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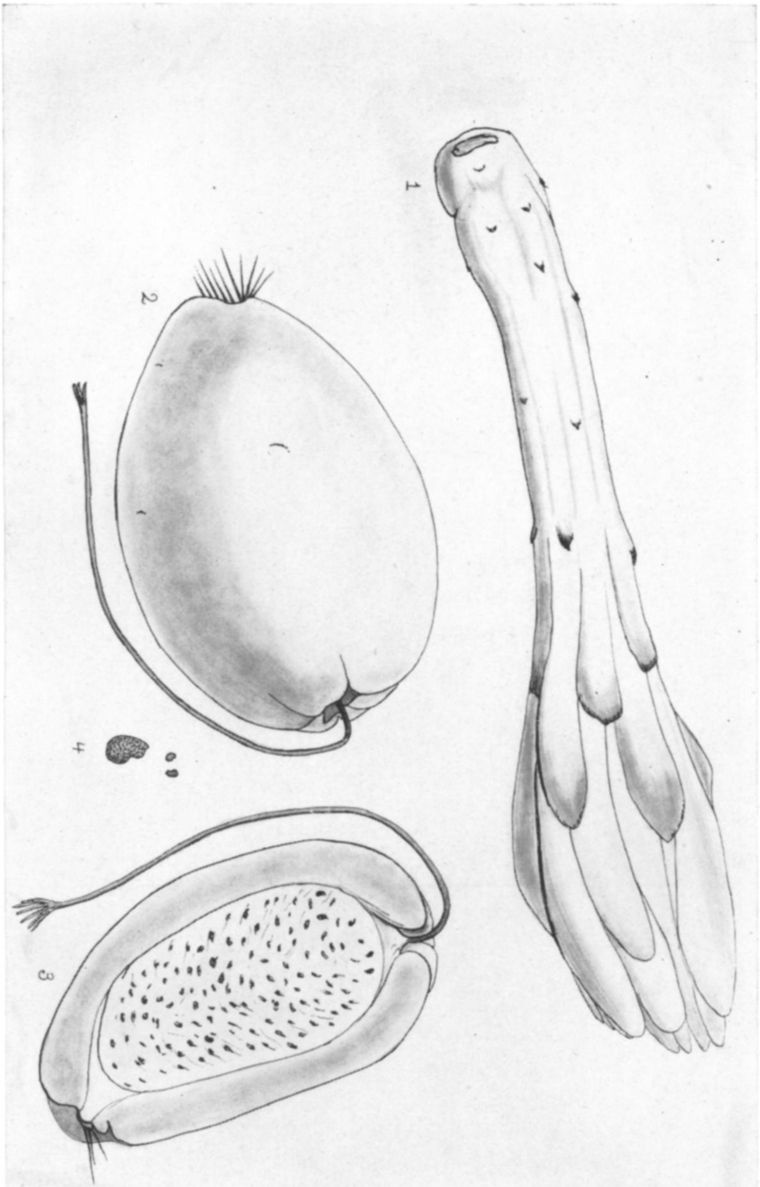

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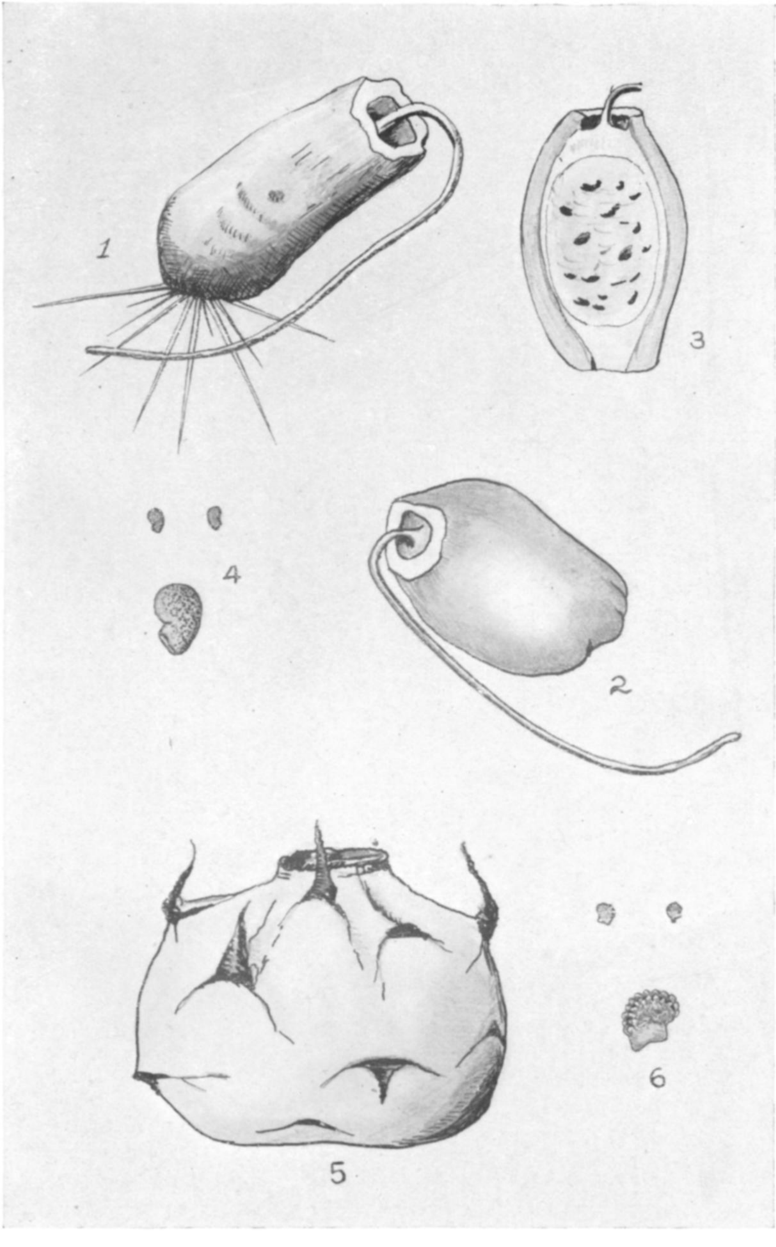

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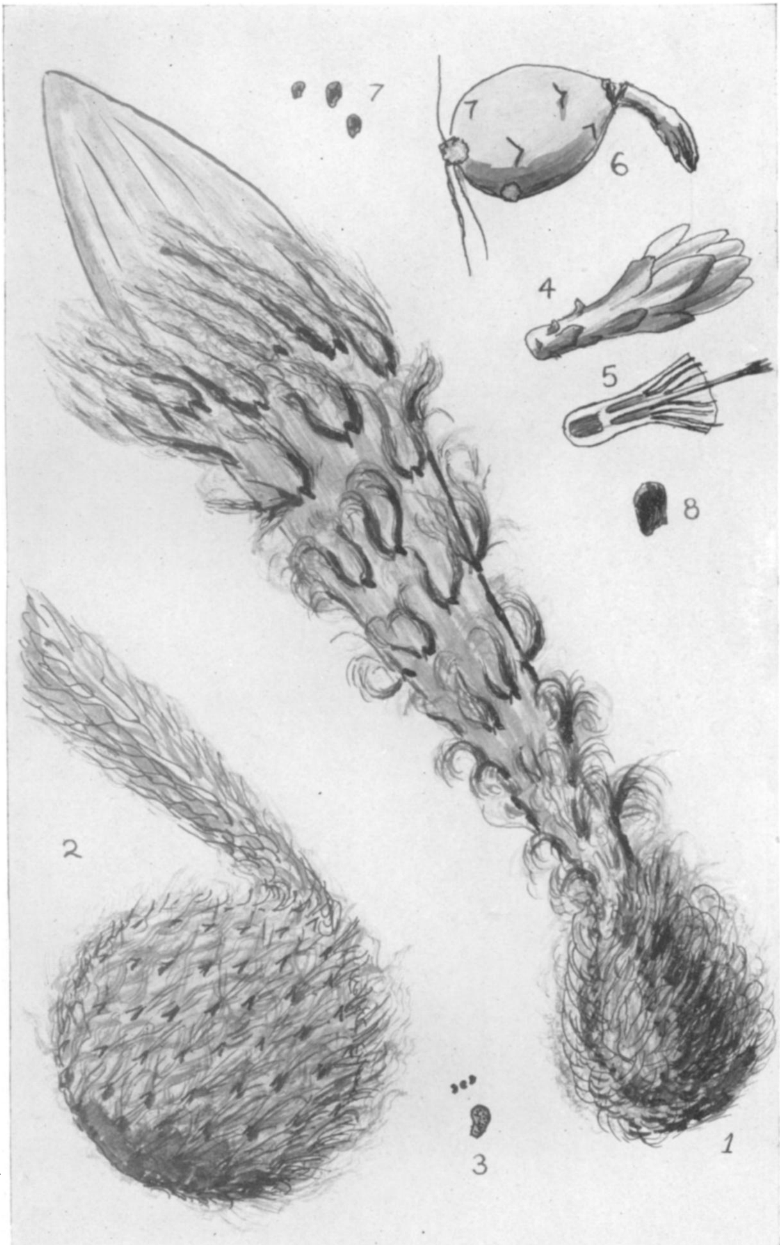

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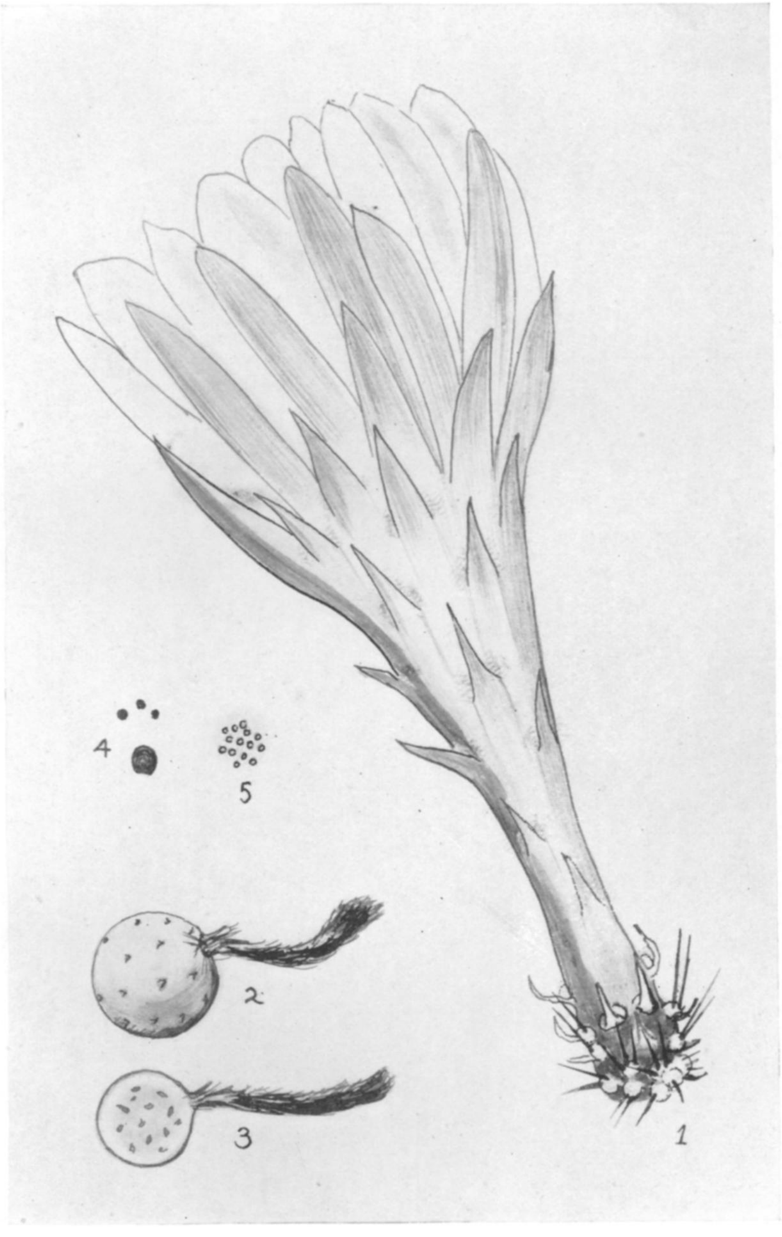

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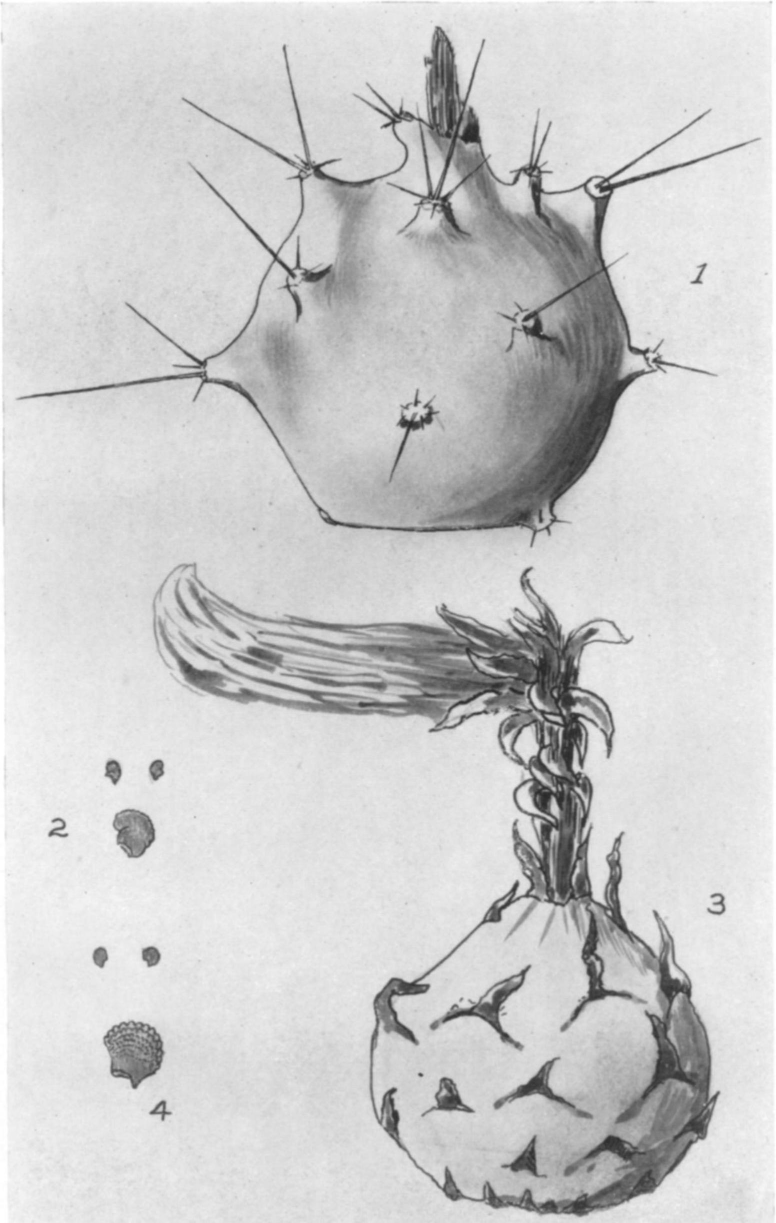

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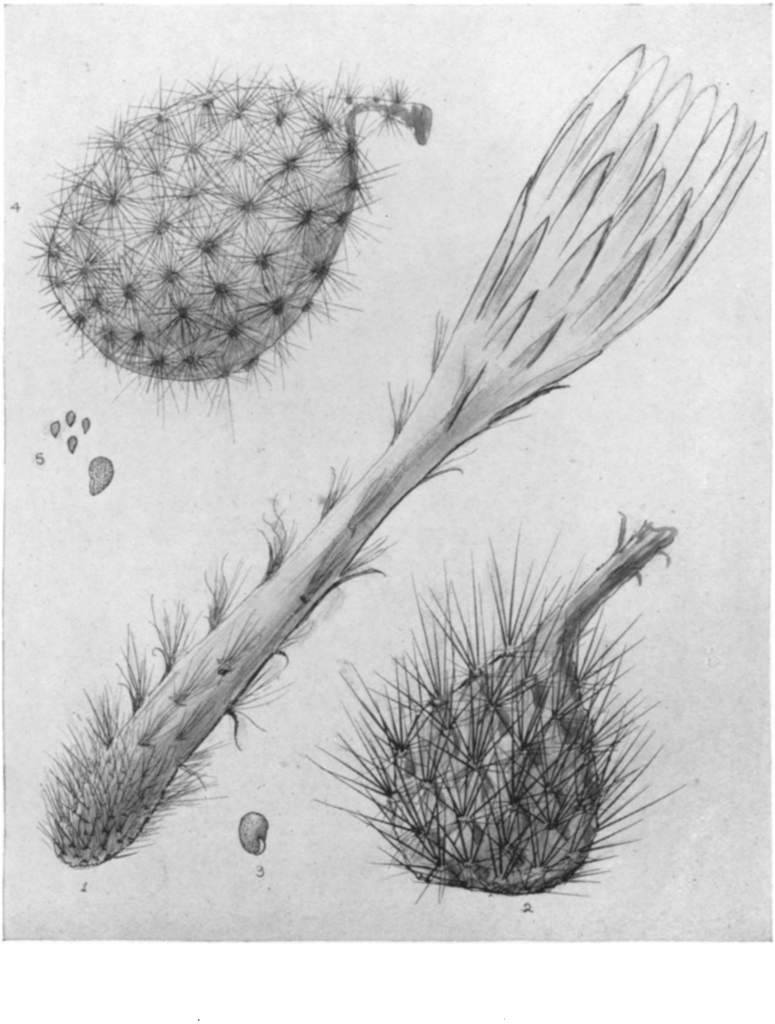

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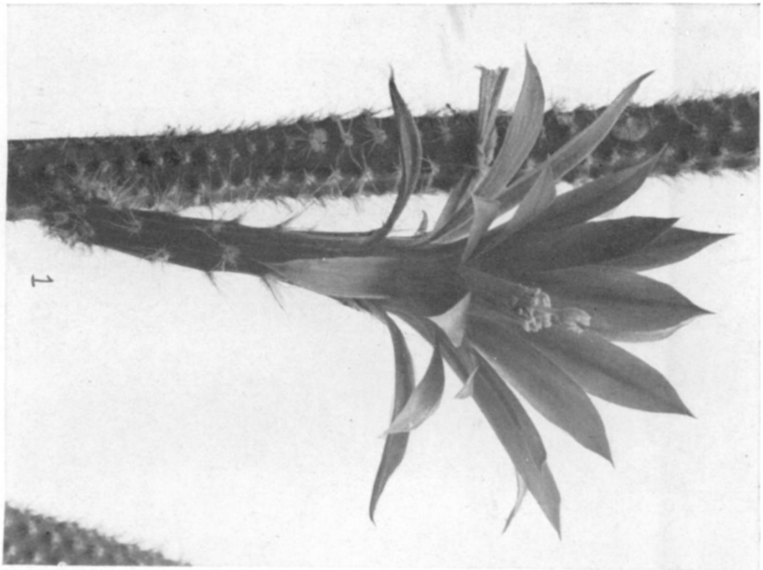

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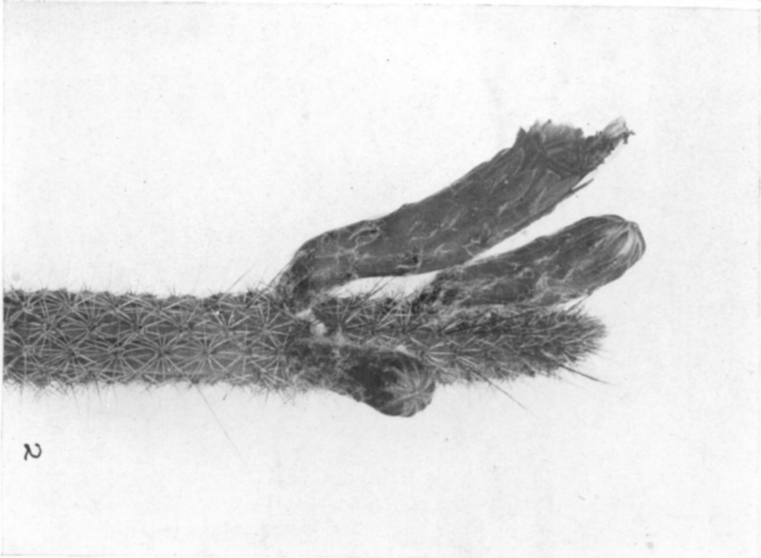

2

CEREUS.—XIV. EUCEREUS: XVII. CLEISTOCACTUS.